than castaways (Nos. 167, 169). In another case, "as the greater part of one side is flat . . . it is evidently done for the purpose of being held in the hand" (p. 86). Again, "the object of making such an instrument is clear," namely, "for insertion in a club" (pp. 94, 95). "There can be no doubt that . . . they have been, or were intended to be, inserted into sockets" (p. 109). No. 159, in which "we have a shaft-smoother, borer and knife included in one object" (p. 116), must have been the delight of some Palæolithic schoolboy! Where statements of opinion occur in such form as "*I* have no doubt," they are of course justifiable; but in this sceptical age it is risky to say "there can be no doubt." It is quite refreshing to hear that there are implements whose "use is almost beyond conjecture" (p. 98). Most likely differentiation in the use of tools did not go far in Palæolithic times.

In the illustrations it would seem that in some cases justice has hardly been done to the specimens, or we should not be told by so experienced a person as the author that No. 144 (Plate ii.) is "the finest example of Palæolithic work" that he has seen. There is, too, a deficiency that should be supplied in another edition: a map and a general section of the district would much help most readers; and these could well be given instead of some of the foreign objects, such as the eternal carved reindeer, &c., without which no anthropological work seems to be thought complete, and which, by frequent repetition, have grown to be nearly as irritating as the faces and figures ever obtruding themselves from the advertising columns of newspapers and magazines.

The frontispiece, by Mr. Worthington Smith, should be acceptable to the advocates of women's rights. The woman is represented as the skilled artist, whilst the man is the mere labourer!

## OUR BOOK SHELF

*Hand-book of Practical Botany for the Botanical Laboratory and Private Student.* By Prof. E. Strasburger. Edited from the German by W. Hillhouse, M.A., F.L.S. (Swan Sonnenschein, Lowrey, and Co., 1887.)

PROF. STRASBURGER'S well-known work, "Das botanische Practicum," has already been reviewed in the pages of NATURE (vol. xxx. p. 214), so that a short notice may suffice for the present hand-book, which is essentially a translation of the *smaller* German edition. Only the account of the fall of the leaf (pp. 156-59) has been taken from the larger work.

The present edition has been fully revised by the author, and also contains a considerable number of editorial notes and additions. The latter are usually indicated by being inclosed in brackets. It would, perhaps, have been better if this had been done throughout, especially in the introduction. A number of additional figures have been inserted by the editor. These are almost all reproductions of familiar text-book illustrations. Many of them certainly come in well, but we cannot help feeling that the constant reappearance of old figures has become rather wearisome, and that in this instance it tends to take off from the freshness which was so pleasant a characteristic of Prof. Strasburger's "Practicum."

We much regret that no account of any of the seaweeds finds a place in this edition. The admirable description of Fucus in the larger treatise of the author might well have been introduced here, while we think that the editor would have been well advised to add an example of the red seaweeds on his own account, or at least to reproduce Prof. Strasburger's description of the fresh-water Batrachospermum. It is easy to see why the author, writing for German elementary students, omitted all reference to seaweeds in his smaller edition. In England we are in a very different position, and it is a pity that students should not at once be made acquainted with plants which are so instructive and so easily accessible.

As the editor explains in his preface that the translation was executed at a time of serious pressure, it would be unfair to enter into any detailed criticism. It must, however, be admitted that the signs of haste are very frequent, and that there is much need for revision in a future edition. There are one or two instances of this which cannot be quite passed over. At p. 11, "durchschnittlich," which means *on the average*, is translated "sectionally," while at p. 49 we have "carefully," where the author says "with advantage" ("mit Vortheil"). At p. 169, note 2, "perfection" should be "development," while on p. 208 the statement that "we *know* the angular outline of the crystals [in Spirogyra] even without reagents," has an odd effect. The word should of course be *recognise*. At p. 67 the use of the word "pits" for the deep depressions ("Grübchen") which lead down to the stomata in Aloe, &c., seems to us likely to confuse the beginner. The phrase "starch-builders" (p. 43, &c.) strikes us as awkward, and is certainly not accurate as a translation. The use of the term *laticiferous cells*, in speaking of Chelidonium, is unfortunate. The organs in question of course come under the head of laticiferous *vessels*.

In conclusion we may express a doubt whether the un-English form "fibro-vasal" has any advantages over the familiar word "fibro-vascular."

The appendices have been much expanded from the original indices of the author, and should be of great use to the student, to whom the book as a whole will be extremely welcome. D. H. S.

*Elementary Practical Biology—Vegetable.* By Thomas W. Shore, M.D., B.Sc. (London: Churchill, 1887.)

THIS book is welcome more as a sign of the ever-growing attention paid to plant-structure than for any peculiar merit it has as a guide to the subject. The author fairly expresses his indebtedness to such practical books as Bower and Vines's, and claims originality only for his arrangement and treatment of the subject. The arrangement is as follows:—First comes an introduction dealing with the necessary apparatus and the preparation, &c., of objects. This is very concisely and sensibly done. Part I. deals with general vegetable morphology, treating in due sequence of the cell, the tissues, the systems of tissues, the apices of stems and roots, and cell-multiplication or cell-reproduction. Part II. is devoted to the Cryptogamia, beginning with the Fungi and working up to the vascular forms. Part III. is confined to the Gymnosperms, and Part IV. to the Angiosperms. So much for the arrangement. There may be no guide to practical work covering precisely all these types in this way, but text-books are by no means wanting which contain this arrangement of matter. The originality here is therefore not at all striking—perhaps fortunately so. As for the treatment, the student is conducted through the course with a baldness in the directions to note this and observe that, which reminds one of the style of a personal conductor through an historic building. The book has a purely practical aim, with the excellent purpose of preventing "cram"; but a student who should undergo this course of instruction, noting and observing no more than he is here directed to do, would find himself, at the end of it, the dispirited possessor of a mass of information which would result in a sad fit of mental indigestion. A practical guide of this kind throws too much of the burden of instruction upon the lecturer whose course accompanies

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it. The style of the whole book leads one to doubt the author's claims as a botanist to write it, and though it it may be a suitable guide to those who have to acquire a knowledge of botany in the course of their studies, it is practically useless for the rearing of botanists. Though one is reluctant to attribute a wrongly-spelt word to other than the conveniently necessary printer, the occurrence of Felicineæ, not once, but regularly, and, moreover, in the boldest and most conspicuous type of the headings of sections, does tempt one to think that the printer's fault lay in not having corrected it. A detailed criticism of the book would exhibit the author's imperfect acquaintance with the types discussed and his errors in description. Such, however, is beyond the scope of this notice.

## LETTERS TO THE EDITOR

[*The Editor does not hold himself responsible for opinions expressed by his correspondents. Neither can he undertake to return, or to correspond with the writers of, rejected manuscripts. No notice is taken of anonymous communications.*

[*The Editor urgently requests correspondents to keep their letters as short as possible. The pressure on his space is so great that it is impossible otherwise to insure the appearance even of communications containing interesting and novel facts.*]

### A Plant which destroys the Taste of Sweetness

During his tenure of office as Governor of Madras, Sir Mountstuart Grant Duff found time, in a way at which I never ceased to marvel, to correspond with this establishment about every kind of detail connected with the botanical productions of Southern India. In one of the last letters which I received from him at the close of last year, before his departure from India, he writes:—"I send you inclosed in this a portion of that delightful plant *Gymnema sylvestre*, an Asclepiad. I shall be curious to know whether when it gets to you it retains the very interesting property that, if you chew carefully two or three leaves of it, it absolutely abolishes for the time the power of tasting sugar. This is no fable, for three of us, I being one, tried it this morning at breakfast with the most complete success. I ate pounded sugar after it without the faintest perception of its saccharine character. I also drank coffee without any sugar in it, and tasted it just as well as I ever did.

"General Elles has just been up to my room to tell me that he also found it abolish the power of enjoying a cigar. Do try it, and report to me, when we meet, whether it stands the long journey. This Gymnema might conceivably be important medically."

We found that the leaves sent by Sir Mountstuart Grant Duff did retain the property he described in a marked way. I immediately wrote to Mr. Lawson, the Director of Public Gardens and Plantations, Ootacamund, to endeavour to procure some seed which we might grow at Kew, so as to obtain material for future experiment. In a letter received from him this morning he promises to do this when the fruit is ripe. He has, in the meantime, been so good as to inclose in his letter a paper by Mr. Hooper, the Government Quinologist, which appears to me to well deserve the wider publicity of the pages of Nature.

The whole matter is a good illustration of the useful work which can be done by scientific men in distant parts of the Empire, which indeed could hardly be done in any other way.

W. T. Thiselton Dyer

Royal Gardens, Kew, April 11

[Mr. Hooper's paper will be found on pp. 565–67.]

### Units of Weight, Mass, and Force

It is not easy to follow Mr. Greenhill in his letter which appeared in Nature of March 24 under the above heading. His main contention appears to be that "weight" connotes not "force" but "mass" in engineering formulæ. Surely it would be more correct to say that the primary idea among engineers is that of force, mass being of secondary consideration and being measured by means of force: the force most commonly referred to being that of gravitation, which is *the* force, *par excellence*, with which the engineer has to deal. And I think it would be impossible to find any ordinary engineering formula involving $W$ (which is generally supposed to stand for *weight*) in which $W$ does not mean gravitation force. Also, in formulæ which have nothing to do with gravitation, and in which $M$ (or *mass*) would naturally appear, the engineer puts $W \div g$ instead of $M$, so as to enable him to express it in terms of his unit of force, the weight of a pound. Thus, the kinetic energy of a moving body is $\frac{1}{2}Mv^2$ (where $M$ is its mass and $v$ its velocity), and is quite independent of its position in space. Engineers, however, who only care about bodies near the earth's surface, express the energy in terms of the merely local phenomenon, the weight or gravitation force acting on the body, which is sufficiently constant for their purposes, and write $\frac{1}{2}Wv^2 \div g$. There is consequently a struggle between engineers and physicists as to whether "*pound*," "*ton*," &c., shall connote the fundamental engineering quantity, namely, *weight*, or the fundamental physical quantity, namely, *mass*; and, naturally, neither side is very willing to give way. The easiest way perhaps would be for the physicists to give another name to the mass-unit, and leave engineers to the enjoyment of their use of the word "pound"; though meanwhile the word might very well connote either *mass* or *weight* (*i.e.* gravitation force) according to the context, the terms pound-mass and pound-weight being used when special clearness is desired. But do not let us, as Mr. Greenhill seems to desire, use weight and mass as synonyms, so losing the advantage of a good word for no good reason.

But Mr. Greenhill's most incomprehensible attack is on the formula $W = Mg$.

The equation means fundamentally neither more nor less than that the force of gravitation on any mass near the earth's surface gives, or tends to give, to that mass a constant acceleration called "$g$," and is to be measured by mass and acceleration conjointly, in accordance with Newton's second law, the fundamental law connecting force and motion. The symbol $=$ means "equivalent to," as it often does.

From this fundamental equation can be deduced special *numerical* equations by means of definitions of arbitrary standards. Thus a "poundal" is the force which will produce in a pound-mass an acceleration of a foot-per-second per second;

$$\begin{aligned} \therefore\ W\,\text{(in poundals)} &= M\,\text{(in pounds)} \times g\,\text{(in ft.-per-sec. per sec.)} \\ &= M\,\text{(in pounds)} \times 32\text{, approximately,} \end{aligned}$$

this equation being merely a *numerical* equation deduced from the fundamental physical equation above. For $W$ (in poundals) means the ratio of the weight of a body to the force called a poundal, or weight per poundal, or $\dfrac{\text{weight}}{\text{one poundal}}$, and so is a mere number depending on the particular mode of measuring $W$: and similarly with the other quantities.

Again, a pound-weight is the force which produces in a pound-mass the acceleration $g$;

$$\therefore\ W\,\text{(in pound-weights)} = M\,\text{(in pound-masses)},$$

or *ambiguously*

$$W\,\text{(in pounds)} = M\,\text{(in pounds)},$$

which is another merely numerical equation, and of course also only an approximate one; as Mr. Greenhill incidentally shows by means of his hypothetical balance at the coal-pit.

Too much importance can hardly be laid on the radical distinction between a physical equation and the various numerical equations which by choice of special units can be deduced from it. This must be my excuse for dwelling so much on the above example. It throws light on the way in which the error cited by Mr. Greenhill in his last paragraph can creep in. Thus, if the mass of a body of weight $W$ is $W \div g$, it really follows that the mass of a body whose weight is $W$ pounds (*or*, less ambiguously, $W$ pounds-weight) $= W$ pounds-weight $\div g$; but by definition one pound-weight $\div g =$ one pound-mass, $\therefore$ the mass $= W$ pound-masses. In Mr. Greenhill's example $W$ is a mere number, and he shows the error caused by trying to insert it in a formula where $W$ means a weight.

In conclusion, if Mr. Greenhill insists on the abolition of the equation $W = Mg$, will he kindly say how he would symbolise the connexion between the force of gravitation on a freely falling body and the induced acceleration $g$? Alfred Lodge

Cooper's Hill, March 30

### The Association's "Geometry"

As the President of the Association for the Improvement of Geometrical Teaching did me the high honour to mention with special approval my work on geometry in his remarks before the

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